*Original article*

# Situated cognition among American football coaches in Japan: Effects of the ongoing method on their coaching cognition

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**Abstract**

We examined the American football coaches' ability to perceive various situations such as alignments, formations, performances, and tactical anticipation during a game. This study investigated the differences in cognition among three coaches at different levels of proficiency (beginner, less experienced, and experienced), by using the "ongoing" cognitive method. This method recorded what and where the coaches observed during a game. Coaches were requested to state their observations while watching these game videos. Data were collected three times to (1) examine the effectiveness of the ongoing method, and (2) determine whether it contributed to improving their coaching skills. Results revealed that the more experienced a coach was, the more he/she recognized better. Their situated cognition improved with the repetition of the ongoing cognitive method as well.

## Introduction

Schön's notion of "reflection-in-action" [1,2] describes how most professional practices are based on the interconnection of thinking and action. Reflection-in-action of practitioners involves "thinking about what they are doing while they are doing it (1987, p. xi)"; moreover, reflection allows practitioners to change the way they go about solving problems. Scholars have suggested that reflective strategies for the improvement of teaching and learning help examine how teachers' cognition and conceptualizations differ between experts and novices.

The ongoing cognitive method records a teacher's statement of his/her cognition and judgement of situations on the spot during a class [3,4], and grasps his/her ongoing teaching skills. This method was first developed by Ikuta in 1998 [3], and its effectiveness has been investigated mainly by Japanese researchers. Studies on physical education teachers and soccer instructors reported that the ongoing method was effective in improving their skills in "recognizing ongoing situations" [5,6]. Regarding the measurement to analyze the differences in ability during the session, Van den Bogert et al. [7] employed the eye-tracking methodology to investigate teachers' visual perception and detection of classroom events. Wolff et al. [8,9] used eye-tracking measurements and a verbal think-aloud to investigate the differences in how expert and novice teachers perceived prob-

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lematic classroom scenes. The current study explored the differences in cognition of a less experienced coach from that of an experienced coach by using the ongoing method and examining whether "reflection- in-action" helped improve the amount of cognition by repetition.

Situated cognition, is constantly used by a coach during an American football game for ongoing situations, as the game progresses. Since the next play strategy is determined by what the coach sees or recognizes within a few seconds, the coach needs to have the ability to recognize ongoing situations quickly and accurately. No study till date (in our knowledge), has investigated the acquisition of situated cognition skills of American football coaches. Most studies in American football, focus on reducing the incidence of all types of injuries such as abrasion, contusion, concussion, fracture, sprain, and strain [10,11]. In addition to injury prevention, recent studies have analyzed players' motion history and positioning, using GPS data to improve coaching skills [12,13]. Hence, in this study, we investigated the influences of the ongoing method on situated cognition skills of American football coaches at the three proficiency levels. We also interviewed the coaches after each recording session, to examine the causes of influences on their cognition and thinking processes using an ongoing method.

**Materials and Methods**

1. Subjects

Subjects in the study comprised three coaches from University X, who belonged to the Kantoh Collegiate Football Association. A coach with (i) 6-months of experience was designated as the "beginner coach", (ii) 6-years of experience as the "less experienced coach", and (iii) 20-years of experience as the "experienced coach." All coaches were offense coaches. Thus, we studied their cognitive skills as offense coaches.

2. Material Videos and Period of Investigation

Videos of three games were used as materials. We ensured that the subjects had no memory of the games that were to be shown. Each game was video recorded from a spotter seat (looking down at the center field from the upper stadium level), overlooking the whole field. The three videos were recorded at one-week intervals in a period before the season of the college football league.

3. Method of Analysis

Following the ongoing cognitive method [1], the video and audio of each coach's utterances of "his cognition of play elements in each game while watching the video," was recorded. For this, we used an IC recorder and a digital video camera. We used the coaches' remarks about the first 30 plays in each game for analysis. Based on Rob Ash's [14] opinion, an individual with a 35-year experience of American football coaching and the former president of the American Football

Table 1. Seven play elements any coach should consider.

| | Pre-snap | | | In Play | | After Play | |
|---|---|---|---|---|---|---|---|
| Code | Sit | OA | DA | OP | DP | OJ | DJ |
| | Situation | Offensive Alignment | Defensive Alignment | Offensive Performance | Defensive Performance | Offensive Adjustment | Defensive Adjustment |
| Ex. | Down Distance Yard Line Hash | Offensive Formation and Motion Defensive Front, Stunts, and Coverage | | Good/Bad Block and Tackle | | Prediction Adjustment | |

Coaches Association, we classified the play elements into seven categories. We then fragmented the coaches' remarks and organized the fragmented remarks for comparison with the seven categories (Table 1). The extraction and categorization of remarks were done by three analysts: (i) a college teacher and former member of a corporate football team in his mid-40's, (ii) a college teacher and coach of a corporate football team in his late 30's, and (iii) a former football coach of a corporate team in his early 50's. To examine the correlation between the number of ongoing methods and changes in cognitive remarks, a t-test and chi-square test were performed. Informed consent was obtained from every study participant, including their consent to participate and publish the findings.

**Results**

1. Frequency of cognitive remarks

Table 2 shows the frequencies of cognitive remarks made by the coaches. The characteristics of each coach's remarks are as follows:

- Beginner coach: Cognitive remarks were largely made regarding the performance of his team (OP). Remarks on the opponent appeared for the first time in the third game: once each on the pre-snap defensive alignment (DA) and on the in-play defensive performance (DP). While the frequency of remarks increased as he watched more games, the number of categories of his remarks did not. The average frequency of remarks recorded among the game sessions was 18.7.
- Less experienced coach: The frequency of remarks on the offensive performance of his team (OP) for any game, was the maximum. The remarks in the pre-snap group for the first game were only on the defensive alignment of the opponent (DA). His remarks in the in-play group were mainly on the performance of his team (OP). A remark on the pre-snap situation (Sit) appeared for the first time in the third game. While the frequency of remarks increased as he watched more games, the number of categories of his remarks did not. The average frequency of remarks among the game sessions was 34.3.

Table 2. Frequencies of cognitive remarks by the coaches.

| Session | Beginner Coach | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre-snap | | | | In Play | | | After Play | | | Total |
| | Sit | OA | DA | Total | OP | DP | Total | OJ | DJ | Total | |
| 1 | 0 | 0 | 0 | 0 | 13 | 0 | 13 | 0 | 0 | 0 | 13 |
| 2 | 0 | 0 | 0 | 0 | 16 | 0 | 16 | 0 | 0 | 0 | 16 |
| 3 | 0 | 0 | 1 | 1 | 26 | 1 | 25 | 0 | 0 | 0 | 27 |
| Session | Less Experienced Coach | | | | | | | | | | |
| | Pre-snap | | | | In Play | | | After Play | | | Total |
| | Sit | OA | DA | Total | OP | DP | Total | OJ | DJ | Total | |
| 1 | 0 | 0 | 6 | 6 | 14 | 4 | 18 | 0 | 0 | 0 | 24 |
| 2 | 0 | 0 | 11 | 11 | 22 | 3 | 25 | 0 | 0 | 0 | 36 |
| 3 | 1 | 0 | 9 | 10 | 23 | 10 | 33 | 0 | 0 | 0 | 43 |
| Session | Experienced Coach | | | | | | | | | | |
| | Pre-snap | | | | In Play | | | After Play | | | Total |
| | Sit | OA | DA | Total | OP | DP | Total | OJ | DJ | Total | |
| 1 | 17 | 1 | 46 | 64 | 49 | 26 | 75 | 8 | 3 | 11 | 150 |
| 2 | 28 | 2 | 53 | 83 | 66 | 19 | 85 | 17 | 7 | 24 | 192 |
| 3 | 36 | 2 | 49 | 87 | 70 | 24 | 94 | 16 | 5 | 21 | 202 |

- Experienced coach: Cognitive remarks were made in all categories, with more remarks on the situation (Sit) and the defensive alignment of the opponent (DA) in the pre-snap group, on the offensive performance of his team (OP) in play and on the offensive adjustment of his team (OJ) after play. This tendency remained the same throughout the game sessions. The average frequency of remarks among the game sessions was 181.3.

Figure 1 shows the increase in frequency of cognitive remarks by each coach through the slope of the corresponding regression line regarding the game sessions and the frequencies of cognitive remarks. Table 3 shows the correlation between the frequencies of cognitive remarks by each coach and the number of game sessions.

There was significant positive correlation ($r = 0.989$) for the beginner coach between the frequencies of his remarks and the game sessions. We also performed a chi-square test for the beginner coach to see the effect of the repetition of game sessions on the frequencies of his remarks and found a significant difference ($\chi^2 = 6.370$, $p < 0.05$).

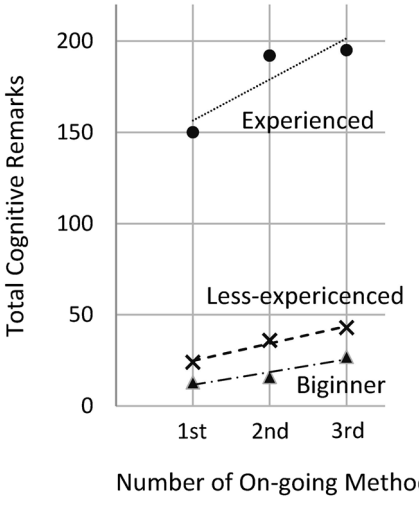


Figure 1. Relationship between the frequencies of cognitive remarks and the sessions of the ongoing method.

2. Analysis of cognitive remarks

We derived the field area of each coach's cognition by analyzing the contents of his remarks (Figure 2-4). Table 4 is an excerpt of the actual cognitive remarks (play 12 and 13 in 2nd session).

- Beginner coach: We found that his remarks through the game sessions were abstract and focused mainly on the motion of a player whose position was the one he had experienced himself as a player. This may be because he was not confident of his remarks since his remarks were often interrogative or ambiguous about the object of remark (Table 4). However, after the first session, the frequency of interrogative remarks decreased, and additionally, he made remarks on the position and motion of the player next to his position (Figure 2).
- Less experienced coach: In the first game session, his remarks were on the motions of the forefront players. In the second game session, his remarks were on the motion of his team, focusing mainly on the motion of the forefront players in the direction of play being carried out (the play side hereafter) (Table 4). In the third session, he also made many detailed remarks on the motion of opponent players in the second row of the play side. The contents of these detailed remarks were the same as those made by the experienced coach, and the frequency of such remarks increased gradually (Figure 3).
- Experienced coach: For any play across the game sessions, his first remark was always on the formation of the opponent team. Once the play started, his remarks were mainly on the motion of his team players on the play side, particularly focusing on the players with superior and inferior motion (Table 4). Through the game sessions, the contents of

Table 3. Correlation between the increase in the cognitive remarks of the coaches and the sessions of the ongoing method.

| Coach | Beginner | Less-experienced | Experienced |
|---|---|---|---|
| Increase Rate of Situational Cognition | 7.5% | 9.5% | 22.5% |
| *r* | 0.982 | 0.989* | 0.894 |

*p<0.01 Increase of situational cognition = Slope of regression line

Table 4. Actual cognitive remarks of 12 plays and 13 plays in the 2nd session.

| Session | Play | Begginer | Less Experienced | Experienced |
|---|---|---|---|---|
| 2nd | 12 | Well… OT… need to work | OK,OK,OK Nice run! Good block on play side | Well, first series of 2nd quarter. Ball on...what yeards? around 35 or 40 yards. 4-3. MLB as usual deep set. Smash. SAM is getting closer to line of scremage. Well... same as last situation, it could be good for quick outside play. I think that it is easy to run SAM side because of his bad reaction. He cannot adjust our Option game. well, our Oline is doing well enough. |
| | 13 | Well… I couldn't see any… | Good Good, well... First step was too slow and late | Why don't we run middle. 4-3. LBs have returned to normal position. He might be care about outside running play. Both DEs care about outside and they rush softly. We need to block OLB whose reaction is no good and so slow. I would say defense backs' run reaction is so fast. We could block MLB well enough. |

| Session | Play | Begginer | Less Experienced | Experienced |
|---|---|---|---|---|
| 2nd | 12 | Well… OT… need to work | OK,OK,OK Nice run! Good block on play side | Well, first series of 2nd quarter. Ball on...what yeards? around 35 or 40 yards. 4-3. MLB as usual deep set. Smash. SAM is getting closer to LOS. Well... same as last situation, it could be good for Sprint Option. I think that it is easy to run SAM side because of his bad reaction. He cannot adjust our Option game. well, our Oline is doing well enough. |
| | 13 | Well… I couldn't see any… | Good Good, well... First step was too slow and late | Why don't we run middle. 4-3. LBs have returned to normal position. He might be care about outside running play. Both DEs care about outside and they rush softly. We need to block OLB whose reaction is no good and so slow. I would say CB's run reaction is so fast, same as SS. We could block MLB well enough. |

LB: the general name for all positions in the middle defense area. MLB: middle LB, SAM: strong side LB, OLB: outside LB. DE: the general name for the positions outside the defense line.

his remarks (their order, targets, etc.) and the field area of his cognition did not change (Figure 4).

3. Analysis of interviews

After each game session, we interviewed the coaches and asked them to talk about the ongoing method freely. Below, we compared the main comments of the coaches after the first session and those after the later sessions.

[Comments on the 1st session]

- Beginner coach: "Because information was too much, I could not catch information of the whole OL (Offense Line: the general name for all positions in the first offense

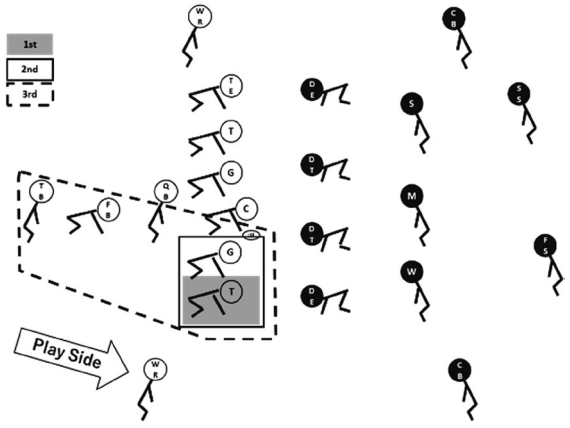


Figure 2. Field area of cognition of the beginner coach.

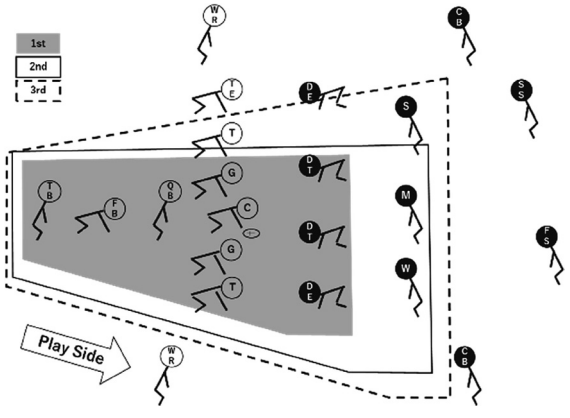


Figure 3. Field area of cognition of the less experienced coach.

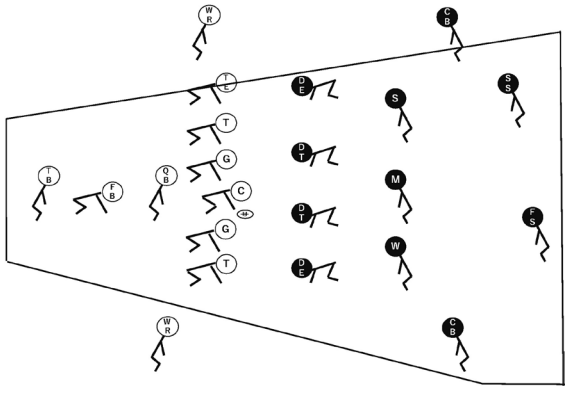

Figure 4. Field area of cognition of the experienced coach.

line) at all. Since I was a player in T (Tackle: a position name), I could catch information only from T and could not watch other positions," "I was so tensed up."

- Less experienced coach: "I could not help following the football, although I tried to see the whole OL, and each play ended so quickly. I just could not grasp the motion of the OL," "It's the same as a real game, and every play ends so quickly."
- Experienced coach: "This is a good training. It gives me the same tension as in a real game."

The two coaches other than the experienced coach, gave the same comments, expressing their difficulty for situated cognition: "a lot of information," "very fast plays" and "frustration of not being able to follow plays enough." As the quantitative data of low frequencies of the cognitive remarks shows, they were aware of "not recognizing enough." Although only included for the experienced coach above, the other two coaches also gave a similar comment: "Tension is the same as in a real game. It is a practical training."

[Comments on later sessions]

- Beginner coach: "I think I could make more comments in the third session. I think I was partly successful in seeing the play-side line after overlooking the whole line," "(Omission) I think I could see the motion on the play side better," "To judge plays better, I need to study the motion of lines more beforehand. I keenly realized that I especially needed to study the motions on the play side. This was a good training of overlooking plays."
- Less experienced coach: "I always tried to overlook the play side. (Omission) By overlooking the play side, I could gradually see the whole motion," "I realized it is important for a football coach to fully understand the plays and to recognize the motion of each

player while overlooking mainly the play side," "Vocalization was useful."

- Experienced coach: "As I thought, recognizing the pre-snap situation was important. Without it, I can 't recognize (all plays)," "To tell the truth, I think I didn't think deeply about the ways to recognize the plays before experiencing this method. (Omission) Experiencing the method, I realized many things. Specifically, I first recognize the pre-snap situation and defense formation and expect some coming plays. Once play is started, I understand the strategy by overlooking the play side and look at the motion of the players involved in the play.," "If you understand the offense strategy, you know the most players involved in it, and they will come into your consciousness later," "This method is so simple but is a good training. I think by using this method in a team, the coaches can have the same understanding of each play. The method is very good for improving each coach's ability to assess situations, which is important in American football," "Vocalization is good. This clarifies your thinking. (Omission) It also allows yourself to hear your thinking and to confirm it," "This study has made me convince what I only perceived before. I can now coach my students more convincingly."

All the coaches experienced an increase in the degree of their cognition with the ongoing method, indicating the effectiveness of the method in improving coaching skills. However, each coach experienced something different. The beginner and the less experienced coaches thought that an important point was "to overlook the play side" and conjectured that practicing the ongoing method improved their cognition. The experienced coach, however, commented, "Since you cannot get enough information if you only consider the motion of offense and defense players after they have started to move, it is very important for you to consciously recognize the pre-snap situation, formation and positions of the players before play is started." He also said that he had realized a definite improvement in his cognition and indicated the effectiveness of the ongoing method in improving the coaching skills of American football coaches.

**Discussion**

We have confirmed that the ongoing cognitive method is effective in increasing the number of recognized play elements and expanding the field area of cognition for any coach, regardless of the length of his coaching experience. It is also among the effects of the method that some sort of "awareness" arose in all the coaches, depending on their experiences and skills. The beginner and less experienced coach became aware of the necessity of "overlooking mainly the play side." While the experienced coach, having a 20-year coaching experience, had been aware of the potential importance of "pre-snap cognition," he realized that judging situations and perceiving the whole play process more accurately became possible not only by recognizing the "pre-snap, in-play and after-play elements" independently but by also recognizing them as a continuous whole. In other words, he realized that pre-snap cognition enabled a more accurate cognition in play and led to better cognition after play. It was a major effect for him that he had realized the necessity of "pre-snap cognition," to which the beginner and the less experienced coaches did not pay much attention.

The experienced coach also realized the effect of vocalization in clarifying his cognition. This demonstrates the arising of a consciousness where "vocalization = cognition" leads to a deeper cognition by the ongoing method, as concluded by Nishihara and Ikuta [15]. This study has shown that the ongoing method brings awareness to American football coaches and enables them to improve their cognitive skills for fast judgment. It

has also indicated the possibility that the method will be a suitable tool for improving coaching skills in American football.

In future studies, it will be necessary to increase the number of subjects and collect data over a longer term to establish the ongoing method as one of the teaching methods for improving the skills of American football coaches.

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**Conflicts of Interest**

There are no conflicts of interest to declare.

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